

Terwilliger Fire
Burned Area Emergency Response Resource Report

Resource Specialty: Recreation, Trails, Wild & Scenic Rivers, Wilderness

Fire Name and Forest Location: Terwilliger Fire, McKenzie River Ranger District, Willamette National Forest

Month and Year: August-October, 2018

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Burned area emergency assessments are rapid evaluations to determine critical values found to be at unacceptable risk due to imminent post-fire threats and to develop appropriate actions to manage unacceptable risks (FSM 2523.1). This report summarizes the assessment of developed recreation and dispersed use, trails, Wild & Scenic Rivers, and Wilderness resources on National Forest System (NFS) lands within and adjacent to, or near, the perimeter of the Terwilliger Fire.

I. Resource Condition Assessment

Resource conditions were assessed through field observation and with information provided by Willamette National Forest recreation, trails, wilderness and fire resource specialists, as well as specialists on the BAER team.

A. Resource Setting

Within or near the perimeter of the fire are included: 5 trailheads, numerous dispersed sites outside wilderness, 5 trails, 1 hot spring, 6 campgrounds, 1 Wild & Scenic river, 1 reservoir, and the Three Sisters Wilderness. Recreational use occurs throughout the year in most of these areas.

Developed Recreation infrastructure within or near the fire perimeters include:

Facility Type	Facility Name	Use Level
Trailhead	French Pete	Moderate
Trailhead	Lower Lowder	Low
Trailhead	Lower East Fork	Low
Trailhead	Upper East Fork	Low
Trailhead	Terwilliger	Very High
Hot Springs	Terwilliger	Very High
Campground	Slide Creek	Moderate
Campground	Sunny Side	Moderate
Campground	Cougar Crossing	High
Campground	French Pete	High
Campground	Hard Rock	Moderate
Campground	Red Diamond	Moderate

These sites may include the following structures: bulletin boards, trail signs, fee tubes, picnic tables, benches, toilets, hitch rails, and parking areas.

Numerous dispersed use sites are located within the fire perimeters and in areas downstream from the fires. Uninventoried sites likely exist within the same areas. These sites do not include infrastructure development and

are user created. These sites are evaluated for risk from imminent post-fire threats due to the concentrated public use that occurs at some of these sites, including camping.

Trails within or near the fire perimeters include:

Trail Name	Trail Number	Special Designations
Rider Creek Trail	3319	Terwilliger Hot Springs Tr.
French Pete Trail	3311	Wilderness
Lowder Mountain Trail	3329	Wilderness
Walker Creek Trail	3330	Wilderness
East Fork Trail	3308	Wilderness

Other routes with special designations include:

Road Name	Road number	Special Designations
Aufderheide Scenic Highway	19	Scenic Highway, state designation

Concerning the South Fork of the McKenzie Wild and Scenic River, the Willamette National Forest Land and Resource Plan (1990) prescribes that all Wild and Scenic rivers will be managed to maintain their eligibility as such. That said, the upper reaches of the South Fork of the McKenzie Wild and Scenic River is also a known river section utilized by boating recreationists.

B. Findings of the On-The-Ground Survey and Critical Values

Critical values assessed in this report are shown in the table below. These values are considered in the risk assessment due to imminent post-fire threats.

CRITICAL VALUES (FSM 2523.1, exhibit 1)
HUMAN LIFE AND SAFETY
Human life and safety on National Forest System (NFS) lands.
PROPERTY
Buildings, water systems, utility systems, road and trail prisms, dams, wells or other significant investments on NFS lands.

Assessment results indicate the following conditions:

Trailheads:

The French Pete trailhead was burned over with no loss of or damage to associated infrastructure. Tree mortality due to fire is significant in all areas surrounding the trailhead with nearly all trees affected by fire. Life and safety risk due to overhead hazards exists as trailheads are a known location of expected congregation of the public and administrative personnel. Treatments to address hazard trees have been partially implemented, and further implementation needs will be included in this report.

All other trailheads were not affected by the fire and have no indications that post-fire effects will impact them.

Regarding Human Life and Safety, post fire effects will exist for years to come. To address this, signage implementation to inform users will be included in this report.

Campgrounds:

All campgrounds were analyzed via site-visits by specialists for post-fire effects. French Pete campground was the only one that our hydrologists thought might be at risk of having two of the campsites along French Pete Creek impacted from increased flows and sedimentation from the fire effects upstream. Upon further analysis, we concluded that the risk to the campsites was too low to legitimize treatments. Cougar Crossing, Sunnyside, Slide Creek, Hard Rock, and Red Diamond campgrounds were either not affected by the fire, or have had post-fire effects mitigated by suppression repair, and are not at risk from further post-fire effects.

French Pete, Hard Rock, and Red Diamond campgrounds are used as access points for boating recreationists on the South Fork of the McKenzie River. Treatments will be included in this report regarding hazard sign installation directed to this boating community with regards to the trees that have and will continue to fall into the South Fork and post boating hazards.

Dispersed use sites:

Dispersed use sites show no indications that post-fire effects will impact them. However, dispersed use sites along the South Fork of the McKenzie River are access points for boating recreationists and will be utilized for signage implementation included in this report.

Developed Use Site – Terwilliger Hot Springs:

Terwilliger Hot Springs is located at the western end of Rider Creek Trail 3319. Springs that emit from the ground above the springs pour into the top pool, which drains into another pool below it, and into 2 more pools before draining out the bottom pool into a channel of an unnamed creek (4 pools total). That unnamed creek is ephemeral, and its channel is directly next to the four mentioned hot spring pools (on their west side), separated by a constructed loose rock wall. A French drain was constructed above the top pool to collect and drain water and debris that erodes from the hillside above it. To the east of the pools are constructed wooden benches, stone steps, railings, a wooden shelter (16ftx12ft), and a path of the same materials that leads uphill and east of the pools to a bathroom facility.

The path to the bathroom and the bathroom facility itself were all affected by the burn and have been burnt to the point where recovery or repair of the infrastructure is impractical to impossible. As such, post-fire effects and resulting treatments in this area will not be included in this report to the effect that they would preserve the infrastructure in this area. However, the fiberglass toilet vaults themselves are intact in the ground and have liquefied exposed human waste still inside them. The vaults themselves, due to the burn, are now exposed to the elements and have filled with rain water mixing with the excrement. This poses an immediate hazardous waste spill risk in the area, and treatment for this risk will be included in this report.

Besides the bathroom path and facility, the stone steps, railings, wooden benches, wooden shelter, French drain, and hot springs pools have been minimally effected by the fire to this point, and are intact. A two foot diameter log has slid down from a hill 30ft above the hot spring pools to the west and has rested on the edge of the rock wall of the hot springs, indicating that material movement is expected to occur. Soil burn severity uphill of the hot spring pools has been assessed as low and moderate, with slope gradients ranging from 20 to a high of 70 degrees. Burned slopes directly above the hot spring pools are over 45 degrees in many areas.

Terwilliger Hot Springs is a very popular destination for Forest visitors year-round, and the constructed spring pools and infrastructure are a large investment managed by the Forest. Given the nature of use in this area and the potential for post-fire effects to cause significant damage to human health/safety and property, treatment in this area will be outlined in this report.

Trails:

All trails within the burned areas were observed via foot travel to determine individual levels of risk based on slope, soil type, and burn severity.

French Pete Trail 3311 was used as a fire flank and was intentionally burned by suppression staff in order to check the fire's progress south. The result is low to moderate soil burn severity above and below the trail and French Pete Creek. Watershed response is expected to increase in fire affected areas due to lack of vegetation, impacted soils and increased runoff of water during storm events. Fire affected trails have reduced infiltrative capacity due to tread compaction and may be subject to substantial damage if water is allowed to concentrate and flow on the trails due to inadequate drainage. Additionally, there is high potential for sedimentation and rock-fall and tree-fall leading to loss of trail tread in these affected areas. If this damage were to occur, it would represent a loss to the forest investment in the construction and maintenance of the infrastructure of these recreation features, as well as decreased public and administrative access. Treatments to mitigate damage to property are included in this report.

East Fork Trail 3308 was affected by the fire where it is established on the south side of the East Fork of the South Fork of the McKenzie River, between the lower footbridge across the East Fork waterway (to the west) and the next river-spanning footbridge uphill from that (to the east), roughly 1.5 miles. Soil burn severity in that area was low in most cases, and observations indicate that post-fire effects on the trail and infrastructure would be minor at worst, and that no treatments are needed.

Rider Creek Trail 3319 is located at the Terwilliger fire origin. This very high use trail is well within the burned area, with nearby soil burn severity observed as moderate below and moderate to high above the trail. Before the fire, a retaining wall held the gravel-filled trail bed in place on slopes greater than 30 degree grade. The fire burned the wooden retaining wall and many of its posts, leaving much of the trail exposed and vulnerable to tread loss due to erosion on the outslope, which is already observed to be occurring. Sedimentation from materials uphill has also been observed in many areas due to loss of vegetation, duff, roots, and other materials due to the burn. Many burned out trees have already fallen across the trail, and more identifiable hazard trees still exist as no mitigation of hazard trees has occurred along the trail corridor. This trail requires emergency treatment in order to stabilize and mitigate anticipated post-fire storm events.

Lowder Mountain Trail 3329 and Walker Creek Trail 3330 are well within the interior Terwilliger Fire perimeter and are within moderate to high soil burn severity areas. However, the sections of these trails affected by the Terwilliger fire have not been maintained in 8 years and are set to be decommissioned. Much of the trail tread in the fire perimeter here is difficult or impossible to locate due to lack of maintenance and vegetative overgrowth, trail erosion, etc. Any treatments of post-fire effects on these trails would likely be futile given the plan for decommissioning them in the near future. No treatments are prescribed for these two trails.

An analysis of soil burn severity on or near trails was completed to determine the increased likelihood for flow accumulation on trails. Trails that experienced moderate to high burn severity in especially unstable areas were considered for additional erosion control and trail tread reinforcement treatments. French Pete Trail 3311 and Rider Creek Trail experienced moderate to high burn severity. Observed and expected trail damage (given no

treatment) includes loss of trail tread, trail cracks, holes from undercutting, and destruction of retaining features. Consequently, these trails are vulnerable to irreversible damage as a result of subsequent storm events. Portions of trails on steep side hills will be damaged by unstable soil movement, rock fall, and tread undercutting due to water infiltrating trail cracks and holes created by sloughs and burned out roots. Erosion and consequent gulling of the trails will occur. The trail mileage affected for each trail is shown in the figure below. Appendix A includes a map of soil burn severity related to fire affected trails.

Soil Burn Severity on or near Trails within the Terwilliger Fire

Trail Name	High/Moderate
East Fork Trail	0 miles
Walker Creek Trail	0 miles
Lowder Mountain Trail	0 miles
Rider Creek Trail	0.5 miles
French Pete Trail	0.5 miles
Total Mileage	1 mile

Road routes: Aufderheide Scenic Highway is located along the eastern perimeter of the Terwilliger Fire (Divisions A/D, west side of Cougar Reservoir), and within and along the eastern perimeter of the fire in Division Zulu. There are no recommended treatments of this route in this report.

South Fork of the McKenzie Wild & Scenic River: This section of the McKenzie River parallels the Aufderheide Scenic Highway and is within and along the eastern ~~perimeter~~ of the Terwilliger Fire in Division Zulu. Due to current and expected down trees and woody debris in the river, and given use of the river by the boating recreationist community, treatments for this section of river will be included in this report.

Wilderness: No post-fire effects are anticipated to include damage to Wilderness Character in the Three Sisters Wilderness.

II. Risk Determination

The Critical Values related to resources assessed in this report due to increased number of hazard trees, erosion, runoff and sediment flows caused by hydrologic response, and infrastructure failure or loss, are:

- Life and safety
- Property and Infrastructure

The risk assessment matrix shown below was used to determine the level of risk to each Critical Value. For individual assessments of resources, see the Terwilliger Fire BAER – Forest Critical Values Tracking Table section of the BAER report.

Summary of findings: The following resource conditions have resulted from the Terwilliger Fire and have critical values with recommended treatments:

- French Pete Trail 3311: Treat tread in areas where moderate soil burn severity and steep slope grade align to pose a risk of severe tread damage and loss.
- Rider Creek Trail 3319: Mitigate hazard trees along the trail corridor that pose a risk to human health/safety and the trail property itself. Stabilize and retain the trail where erosion threatens irreversible and substantial loss of trail surface and sub-surface structure.
- Terwilliger Hot Springs: Reconstruct French drain uphill of top soaking pool to allow for continued effectiveness given anticipated increased sedimentation resulting from loose materials uphill. Reconstruct loose rock wall along western edge of soaking pools to withstand increased flows in

adjacent unnamed creek. Extract and remove hazardous human waste from the two burned fiberglass toilet vaults.

- Signs: Current area closures should mitigate health and safety concerns to an extent, but closure orders could be removed by spring 2019 while post-fire hazards still remain within the burned area. Install signs to warn users of post-fire hazards at lower and upper East Fork Trailheads, Lower and Upper Lowder trailheads, French Pete Trailhead, a dispersed site use for boating access on the upper South Fork on the McKenzie River, Hard Rock and Red Diamond Campgrounds, and at the entrance to Terwilliger Hot Springs.

Risk Assessment Matrix Used to Determine the Level of Risk to Each Critical Value
(FSM 2523.1 –BAER Risk Assessment)

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

Probability of Damage or Loss: The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within one to three years (depending on the resource):

Very likely - nearly certain occurrence (>90%)

Likely - likely occurrence (>50% to < 90%)

Possible - possible occurrence (>10% to <50%)

Unlikely - unlikely occurrence (<10%)

Magnitude of Consequences:

Major - Loss of life or injury to humans; substantial property damage; irreversible damage to critical natural or cultural resources.

Moderate - Injury or illness to humans; moderate property damage; damage to critical natural or cultural resources resulting in considerable or long term effects.

Minor - Property damage is limited in economic value and/or to few investments; damage to natural or cultural resources resulting in minimal, recoverable or localized effects.

III. Treatments to Mitigate the Emergency

Treatment #1: Trail Tread Stabilization

- A. Treatment Objective: Protection of Property
- B. Treatment Description: Trail Stabilization – Work will include tread leveling and repair, including removal of soil deposits from erosion runoff, trail re-benching, and construction of retaining walls. Trail program manager and crew lead time for coordination with partners and contractors regarding trail conditions and for PAO communication with social media and websites are included. Work will be completed with Force Account labor (reduced cost) if that is available at the time implementation is necessary.

Treatment Cost:

Costs Estimate (per mile)				
Item	Cost	Quantity (Day)	Total	Notes
GS-11 Staff	\$400	1	\$400	Administration
GS-9 Trails	\$330	1	\$330	Project Coordination
COR	\$300	4	\$1,200	Contract Officer
Contractor	\$900	10	\$9,000	Project Implementation
GS-9 PAO	\$300	1	\$300	Social media and website updates
Total:		\$11,230 per mile		

Trail Name & Number	Units	# of Units	Unit Cost	Total Cost
French Pete Trail 3311	Miles	.5	\$11,230	\$5,605
Rider Creek Trail 3319	Miles	.5	\$11,230	\$5,605
Total Trail Mileage: 1		Total Cost:		\$11,230

The cost comparison below estimates the cost of property reconstruction in the scenario that no treatment action is taken and loss of property results:

Costs Estimate (per mile)				
Item	Cost	Quantity (Day)	Total	Notes
GS-11 Staff	\$400	4	\$1,600	Administration
GS-9 Trails	\$330	10	\$3,300	Project Coordination
COR	\$300	10	\$3,000	Contract Officer
Contractor	\$900	30	\$27,000	Project Implementation
GS-9 PAO	\$300	3	\$900	Social media and website updates
Total:		\$35,800 per mile		

Trail Name & Number	Units	# of Units	Unit Cost	Total Cost
French Pete Trail 3311	Miles	.5	\$35,800	\$17,900
Rider Creek Trail 3319	Miles	.5	\$35,800	\$17,900
Total Trail Mileage: 1		Total Cost:		\$35,800

Treatment #2 – Warning Signs

- A. Treatment Objective: Protection of Life and Safety
- B. Treatment Description: Install warning signs to alert visitors of burned area post-fire effects on trails, at campsites, and at dispersed and developed use sites. Program manager coordination and PAO media communication are included.
- C. Treatment Cost: The unit cost of the sign includes labor cost for ordering and installation. Estimated 1 day needed for total sign installation time.

Treatment	Units	# of	Unit	Total Cost
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		Units	Cost	
Trail warning signs for wilderness trailheads	Each	5	\$300	\$1,500
Dispersed site warning signs (outside of wilderness)	Each	1	\$300	\$300
Campground warning signs	Each	2	\$300	\$300
Terwilliger Entrance	Each	1	\$300	\$300
GS-9 Wilderness	Days	.5	\$330	\$165
GS-9 PAO	Days	2	\$300	\$600
Total Cost:				\$3,165

Treatment #3 – Terwilliger Hot Springs

- A. Treatment Objective: Protection of Life and Safety and property
- B. Treatment Description: Reconstruct French drain uphill of top soaking pool to allow for continued effectiveness of drain given anticipated increased sedimentation resulting from loose materials uphill. Reconstruct loose rock wall along western edge of soaking pools to withstand increased flows in adjacent unnamed creek. Extract and remove hazardous human waste from the two burned fiberglass toilet vaults. Program manager coordination with contractors, partners (volunteers, American Land and Leisure, etc.) and PAO media communication are included.
- C. Treatment Cost: Cost is adjusted for oversight of the project and implementation of the project by contractors. Work will be completed with Force Account labor (reduced cost) if that is available at the time implementation is necessary.

Contract Cost Estimate				
Treatment	Units	# of Units	Unit Cost	Total Cost
Reconstruct French drain	Each	1	\$3,000	\$3,000
Rebuild western soaking pools' wall	Each	1	\$9,000	\$9,000
Removal of human waste from toilet vaults	Each	2	\$3,500	\$7,000
COR	Day	5	\$300	\$1,500
GS-9 Developed Rec Prgm Mgr	Day	1	\$330	\$330
GS-9 PAO	Day	.5	\$300	\$150
Total Cost:				\$20,980

The cost comparison below estimates the cost of property reconstruction in the scenario that no treatment action is taken and loss of property results. Note that threats to human health and safety will not be mitigated in this scenario:

Contract Cost Estimate				
Treatment	Units	# of Units	Unit Cost	Total Cost
Reconstruct soaking pools	Each	1	\$400,000	\$400,000
COR	Day	20	\$300	\$6,000
GS-9 Developed Rec Prgm Mgr	Day	10	\$330	\$3,300
GS-9 Engineer	Day	20	\$330	\$6,600
GS-11 Engineer	Day	10	\$400	\$4,000
GS-9 PAO	Day	6	\$300	\$1,800

Total Cost:		\$421,700
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IV. References

BAER Guidance Paper, Hazard Trees, April, 2013
BAER Guidance Paper, Roads and Trails, January, 2013
EM 7100-15 Sign and Poster Guidelines for the Forest Service, 2013
FSM 2500, Chapter 2520 – Watershed Protection and Management
Interagency Burned Area Emergency Response Guidebook, version 4.0
Willamette National Forest Land and Resource Management Plan, 1990

V. Consultations

Darren Cross, District Ranger, McKenzie River Ranger District
Tyson Cross, Trails, Wilderness, OHV/Winter Recreation Program Manager, McKenzie River Ranger District
Wayne Chevalier, Trail Crew Lead Foreman, McKenzie River Ranger District
Dave Sanders, Developed Recreation Program Manager, McKenzie River Ranger District
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VI. Appendices

- A. Photos
- B. Sign examples